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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09 500,288	02 08 2000	Shinichi Nagahama	NICHIA-00800	2385

23117 7590 03 31 2003

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EXAMINER

LOUIE, WAI SING

ART UNIT

PAPER NUMBER

2814

DATE MAILED: 03/31/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

ALC

Office Action Summary	Application No.		Applicant(s)	
	09/500,288		NAGAHAMA ET AL.	
	Examiner		Art Unit	
	Wai-Sing Louie		2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 January 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 17-22 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 17-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s) _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. (US 6,177,292) in view of Koide (JP 11-145516) and Kern et al. (US 6,194,742).

With regard to claim 17, Hong et al. disclose gallium nitride semiconductor diode (col. 4, line 3 to col. 11, line 64 and fig. 7) comprising:

- A GaN substrate 70 having a single-crystal GaN on its surface. Hong et al. do not disclose the single-crystal GaN layer 70 is formed through a lateral-growth process. However, Koide disclose a lateral growth method to form a GaN layer 3 on a sacrificial Si substrate. The GaN layer 3 would epitaxially grow in vertical as well as laterally direction (Koide [0001] to [0005] and fig.1). Koide teaches the lateral grow method would not generate cracks and dislocation within the GaN layer (Koide [0004]). Therefore, it would have been obvious to one with ordinary skill in the art to modify Hong's device with the teaching of Koide to provide a lateral grow GaN layer on the substrate 70. Doing so would avoid forming cracks in the GaN layer:

- Hong et al., modified by Koide above, would disclose a small crack preventing layer 2 made of $\text{Al}_a\text{Ga}_{1-a}\text{N}$ ($0 < a < 0.15$) and contacting the substrate (Koide [0015] and fig. 1). Although, the mole fraction of aluminum is not $0 < a < 0.1$ as claimed. However, in the case where the claimed ranges “overlap or lie inside the ranges disclosed by the prior art” a prima facie case of obviousness exists (In re Wetheim, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); In re Woodruff, 919 F.2d 1575, 1578, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990)). Similarly, a prima facie case of obviousness exists where the claimed ranges and the prior art ranges do not overlap but are close enough that one skill in the art would have expected them to have the same properties (Titanium Metals Corporation of America v. Banner, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985); See MPEP 2144.05). Hong et al. do not disclose the AlGa_N layer has a coefficient of thermal expansion less than that of GaN substrate. However, Kern et al. disclose a LED having an AlGa_N device-forming layer (interfacial layer 16). Kern et al. disclose the coefficient of thermal expansion of GaN and AlN (see col. 2, table 1). By estimation, the coefficient of thermal expansion of $\text{Al}_a\text{Ga}_{1-a}\text{N}$ is about 4.45×10^{-6} /K, when $a=0.1$. The coefficient of thermal expansion of AlGa_N layer is, therefore, less than GaN substrate thereby providing compression strain on the AlGa_N crack-preventing layer (Kern col. 4, lines 29-32);
- An n-type cladding layer 71 containing Al (fig. 7);
- An active layer 72 containing InGa_N (fig. 7);
- A p-type cladding layer 73 containing Al (fig. 7).

With regard to claim 18, Hong et al., modified by Koide in claim 17 above, disclose the n-type cladding layer 71 contains more Al than the small crack-preventing layer (col. 10, lines 25-26).

With regard to claims 19-20, Hong et al., modified by Koide in claim 17 above, disclose the small crack-preventing layer 2 has a thickness of 5 micron (Koide [0015]).

With regard to claim 21, Hong et al., modified by Koide in claim 17 above, disclose the small crack-preventing layer 2 has been grown without an impurity doping (Koide [0015] to [0016]).

With regard to claim 22 and in according to claim 17 above, Hong et al. disclose an InGaN layer 52 is intervened between the small crack-preventing layer and the n-type cladding layer (fig. 5).

Response to Arguments

Applicant's arguments with respect to claims 9-16 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wai-Sing Louie whose telephone number is (703) 305-0474. The examiner can normally be reached on 7:30 AM to 4:00 PM.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

wsl
March 21, 2003


LONG PHAM
PRIMARY EXAMINER